

More recently, light-gathering fluorescent fibers having spaced apart ends at which light gathered along exposed longitudinal surfaces of the fiber is emitted at the ends of the fiber to provide a bright dot, have been mounted in archery pins. The small dots are readily observable when the axis of the end portion of the fiber is aligned with the user's eye.

5 In previous attempts to mount light-gathering fluorescent fibers in an archery pin, one end of the fiber has been mounted in a hole provided in the distal end of the pin and a second end of the fiber has been inserted through a base portion of the pin or received within a groove or ring provided on the base portion of the pin. In these arrangements, the second end of the optical fiber is also exposed. Such arrangements are not only distracting, with two aiming indicia
10 mounted on the same pin being visible, but can actually lead to confusion and distraction, which result in decreased concentration on the correct exposed optical fiber end.

Therefore, it is desirable to have an archery pin for a bow in which only one end of an optical fiber is viewable by the archer. It is also desirable to have such a pin in which the light gathering optical fiber emits light that provides a bright aiming indicia even under low light
15 conditions.

SUMMARY OF THE INVENTION

The present invention is drawn to a sight pin assembly having an optical fiber wherein only one end of the optical fiber is viewable by the archer, and can optionally incorporate a light
20 emitting member to provide a bright aiming indicia under low light conditions. The sight pin assembly includes an elongate pin having a first end and a second end. An elongate light-

gathering optical fiber has a first end supported at the first end of the elongate pin such that it is visible when viewing a front of the elongate pin. The second end of the light-gathering optical fiber is supported at a second end of the elongate pin and obscured from view when viewing the front of the elongate pin.

- 5 The light-gathering optical fiber is received in the second end of the elongate pin. The elongate pin has a cavity in the second end and the second end of the light-gathering optical fiber is received within the cavity. The cavity contains a light emitting member disposed adjacent the second end of the light-gathering optical fiber. The light emitting member may be tritium. At least a portion of the cavity is threaded for attachment to a pin holder of an archery bow sight.
- 10 The light-gathering fiber enters the second end of the elongate pin at an obtuse angle to an axis of the elongate pin as measured between the second end of the elongate pin and the light-gathering optical fiber. Alternately, the light-gathering optical fiber enters the second end of the elongate pin at a right angle to an axis of the elongate pin. This can be concentric about an elongate cavity which is perpendicular to the axis of the elongate pin. A support fin can extend
- 15 outwardly from the elongate pin which bridges a space between the light-gathering optical fiber and the elongate pin. The second end of the elongate pin may have a rectangular cross-section.

BRIEF DESCRIPTION OF THE DRAWINGS

In the accompanying drawings, Fig. 1 is a top view of an archery pin assembly embodying the present invention, showing the archery pin assembly secured in a pin holder that is mountable on a bracket that is attachable to a bow, the pin holder being shown in section;

5 Fig. 2 is an end view of the archery pin illustrated in Fig. 3, embodying the present invention;

Fig. 3 is a side view of the archery pin illustrated in Fig. 1, embodying the present invention;

10 Fig. 4 is a perspective view of a colored fluorescent optical fiber having a clear core;

Fig. 5 is a cross-sectional view of an alternate embodiment of the archery pin assembly embodying the present invention; and

Fig. 6 is a cross-sectional view of an alternate embodiment of the archery pin assembly embodying the present invention.

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DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

In the illustrated embodiment, a sight pin for an archery bow is generally indicated in the drawings by the reference numeral 10. The pin 10 shown in Fig. 1 is secured on a pin holder 12 that is attachable to an archery bow, not shown. The pin holder 12 has a vertical slot 14 that permits the pin 10 to be adjusted vertically along the slot 14. The slot 14 has an enlarged opening 16 at the pin side of a slot that it is sized to intimately receive a square or rectangular

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shank 18 of a base portion 20 of the pin 10, and thereby inhibit rotation of the pin 10 within the enlarged opening 16 of the slot 14. At an opposite end of the slot 14, an enlarged opening 22 is provided to receive a washer 24 or screw head therein. The pin 10 is adjustably secured to the pin holder 12 by a threaded adjusting screw 26 that engages threads provided in a threaded cavity 28 extending inwardly into the base portion 20 from an end wall 30 of the base portion 20. Tightening the adjusting screw 26 pulls the base portion 20 of the pin 10 into fixed contact with the pin holder 12, with the shank portion 18 of the base portion 20 non-rotatably seated and fixed in the slot 14. By loosening the adjusting screw 26, the position of the pin 10 can be adjusted vertically whereupon, when the pin 10 is at the desired position, the adjusting screw 26 is again tightened.

The pin 10 is conventionally formed of metal, plastic, or a combination of metal and plastic. If a combination one portion of the pin 10, e.g., the base portion 20, is formed of plastic and the remaining portion, i.e., a sighting indicia support portion 32 extending outwardly from the base portion, is formed of metal. As described above, desirably at least the base portion 20 of the pin 10 has a square or rectangular external shape to provide flat surfaces that engage the slot 14 whereby rotation of the pin 10 is prevented when the adjusting screw 26 is tightened.

A distal end 34 of the support portion 32 has an aperture 36 that is sized to intimately receive a first end 38 of an elongated light-gathering optical fiber 40. A support fin 41 bridges the space between elongated light-gathering optical fiber 40 and the pin 10 to provide support to the fiber 40. The support fin 41 can be constructed of either plastic or metal.

Light-gathering optical fibers gather light along exposed circumferential surfaces of the optical fiber and focus the gathered light onto the end faces of the fiber. In the present invention, the exposed circumferential surface of the optical fiber **40** is generally indicated by the reference numeral **42**. The light gathered through the exposed circumferential surface **42** is directed to the first end **38** of the optical fiber whereat the end face provides a brilliant dot, especially when the optical fiber **40** has fluorescent properties, for use by an archer as an aiming indicia. Light gathered through the exposed circumferential surface **42** is also directed to a second end **44** of the optical fiber **40**, which is disposed within an end portion **45** of the threaded cavity **28** provided in the base portion **20** of the pin **10**. As best shown in Fig. 1, a portion of the optical fiber **40** adjacent the second end **44** is disposed within an elongated aperture **46** extending between the end portion **45** of the threaded cavity **28** and an external surface of the pin **10**. The elongated aperture **46** is preferably disposed at an obtuse angle α with respect to a longitudinal axis **48** of the threaded cavity **28** to avoid sharp bends in the optical fiber **40**. Thus, the light directed to the second end **44** of the optical fiber is effectively blocked from view by the archer, thus avoiding any distraction or other impediment to the archer from focusing his sole attention on the bright dot at the first end **38** of the optical fiber **40**.

To more clearly illustrate the pin **10**, the optical fiber **40** is not shown in Figs. 2 and 3. However, when the present invention is considered as a pin assembly, the assembly includes not only the pin **10**, but also the optical fiber **40** mounted within the pin as illustrated in Fig. 1.

It should also be recognized that, if desired, a light emitting source, such as a capsule containing a phosphor and a radioactive gas, e.g., tritium gas, could be disposed in the end portion **45** of the threaded cavity **28** at a position adjacent to and touching or slightly offset from the second end **44** of the optical fiber **40**. If the light source is not touching the fiber **40**, a distance of within approximately 0.01 inches is preferred, though greater offsets are operable and within the scope of this invention. Such an arrangement provides an additional light source for use of the pin **10** under very low light conditions when the ambient light gathered through the circumferential surface **42** of the light gathering fluorescent optical fiber **40** may be diminished. Further, in situations where a light source is utilized, a clear optical fiber, colored optical fiber, or an optical fiber **40** having a clear core with an colored exposed circumferential surface **42**, for example a colored fluorescent cladding, (FIG. 4), can be used. When using a light source, the fiber **40** having a clear core and colored circumferential surface **42** is preferred. The clear core ensures maximum transmission of light from the light source through the optical fiber **40** in low light conditions, while the colored circumferential surface **42** produces a colored aiming indicia in moderate to bright lighting.

In an alternate embodiment, illustrated in Fig. 5, a pin **10'** has a stepped second elongated aperture **50** disposed at substantially a 90° angle with respect to the longitudinal axis **48'** of threaded cavity **28'**. In this arrangement, the elongated aperture **50** extends horizontally through the base portion **20'** of the pin **10** with the end of the aperture **50**, facing an archer, plugged with a cap **52** to prevent visual observation of the second end **44'** of the optical fiber **40'**.

The cap 52 can thread into the base portion 20' or can be retained frictionally or with an adhesive. Also, the cap 52 can optionally contain a light source 54 which transmits light into the end 44' of the optical fiber 40'. In this arrangement, the light source 54 may comprise a vial or bulb containing a phosphor and tritium in a gaseous state. It is preferable that the light source 54 by optically coupled, for example through a lens or transparent glue, or within 0.01 inches of the end of the fiber 40' to ensure the optimum transmission of light into the fiber 40'. Distances greater than 0.01 inches have been found to be operable and are within the scope of this invention. It is also preferable that the centerline of the light source 54 be substantially aligned with the center line of the fiber 40' to ensure transmission of light from the light source 54 into the optical fiber 40'.

FIG. 6 depicts a detail of the pin 10' utilizing an alternate configuration of light source 54". As above, light source 54" can be contained in a cap 52"; however, in this embodiment the light source 54" is surrounded by a white protective sleeve 56. The protective sleeve 56 can be, for example, a polymer material adapted to cushion the light source 54" from impact and prevent breakage. Because sleeve 56 is white, it tends to reflect light from the light source 54" inward toward optical fiber 40'. Sleeve 56 can be retained in the cap 52" with an adhesive 62.

Additionally, cap 52" can incorporate a lens 58 between the light source 54" and the second end 44 of the optical fiber 40'. Lens 58 can be configured to focus light from the light source 54" into the fiber 40'. In a preferred embodiment the lens 58 is a hard transparent

material, for example a sapphire lens, that in addition to its optical properties, serves to shield the light source 54” from intrusion by the second end 44 of optical fiber 40’. Alternately, lens 58 can be an optical connector such as a deposit of transparent silicon, acrylic, glue or other transparent substance that transmits or focuses light from the light source 54” into the fiber 40 and protects the light source 54”.

Referring again to FIG. 1, a preferred method for assembling the pin 10 with the optical fiber 40 is hereinafter described in detail. One skilled in the art will appreciate that the preferred method of assembly described herein applies to each of the embodiments described herein and depicted in FIGS. 1-6. First, the second end 44 of a length of optical fiber 40 is flared such that the diameter of the optical fiber 40 at the second end 44 is slightly greater than the diameter of the elongate aperture 46. The first end 38 of optical fiber 40 is then inserted into the elongate aperture 46 from inside the threaded cavity 28. The fiber 40 is pulled through the elongate aperture 46 until the second end 44 frictionally lodges in the aperture 46. If needed, an adhesive can be provided on the flared second end 44 to additionally secure the second end 44 in the elongate aperture 46. Also, the aperture can have a chamfered edge (best seen in FIG. 6 with respect to aperture 50 and chamfer 60). One of ordinary skill in the art will appreciate that in an embodiment utilizing a light source 54 (FIGS. 5 and 6) the flared second end 44 can act to collect and direct more light into the optical fiber 40.

With second end 44 secured in the aperture 46, the first end 38 is then inserted through the aperture 36 in the support portion 32 of the pin 10. The optical fiber 40 is then

trimmed at the first end **38** to an appropriate length. The fiber **40** is preferably trimmed to a length that allows the fiber **40** to arc substantially smoothly from the elongate aperture **46** to the aperture **36** of the support portion **32** without kinking. If a support fin **41** is provided, the length of the fiber **40** should allow the fiber **40** rest on the fin **41** substantially without slack in the fiber

5 **40**. Slack in the fiber **40** may allow the fiber **40** to shift and impact and possibly damage the light source **54**.

After the optical fiber **40** is trimmed, its first end **38** is then inserted through the aperture **36**. The first end **38** is then flared to be frictionally retained in the aperture **36** of the support portion **32**, and such that the optical fiber **40** is substantially without slack. One of
10 ordinary skill in the art will appreciate that flaring the first end **38** of the optical fiber **40** can increase the size of the brilliant dot seen by the user.

It is to be understood that while the invention has been described above in conjunction with preferred exemplary embodiments, the description and examples are intended to illustrate and not limit the scope of the invention. Thus, the scope of the invention should only
15 be limited by the following claims.